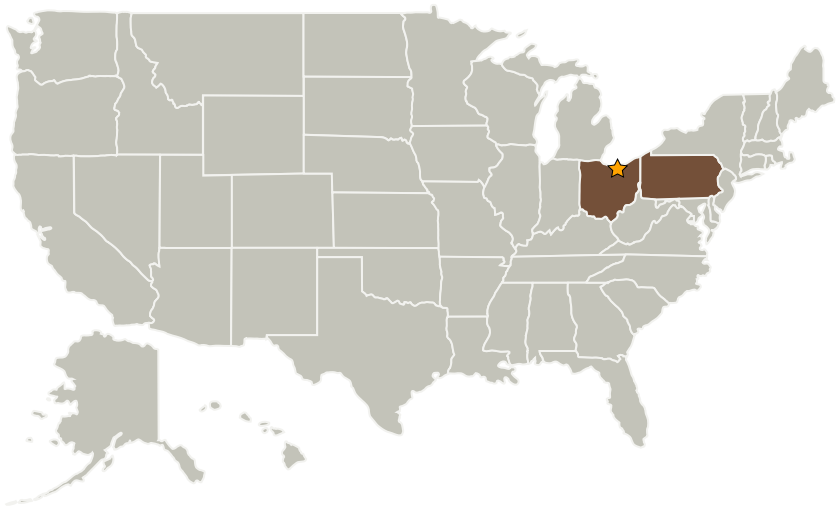
Accelerated Testing of High Temperature Permanent Magnets for Spacecraft Propulsion, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

High temperature permanent magnet materials play an important role in NASA's space missions in electric propulsion, energy generation and storage and other applications. We propose to devise accelerated testing methods to test and predict the service life of SmCo based ultra high temperature permanent magnets in a high vacuum environment at high temperatures in excess of 400 degrees C. The proposed research will enable designers to appropriately design and use high temperature permanent magnets to optimize their performance. The proposed efforts will measure outgassing rates through total mass loss methods based on ASTM standards at temperatures from 300 to 700 degrees C at vacuum levels of 10 exp-5 Torr or higher. The microstructure and chemical composition variations at the near-interface region after exposure to high vacuum and high temperatures will be analyzed with scanning electron microscopy and auger electron spectroscopy or energy dispersive X-ray spectroscopy. Magnetic properties will be measured and modeled with finite element analysis. These methods will enable prediction of reliability and performance of high temperature magnets over long space missions through short-term test methods.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Electron Energy Corporation	Supporting Organization	Industry	Landisville, Pennsylvania

Primary U.S. Work Locations	
Ohio	Pennsylvania

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.1 Electrochemical: Batteries